

**CLAIMS:**

1. A chuck for a semiconductor processing system, comprising:  
an annular substrate receiving member having an upper substrate receiving surface formed thereon;  
a hemispherical reinforcement member affixed to a lower surface of the substrate receiving member; and  
an elongated stem portion affixed at a distal end to the hemispherical reinforcement member.
2. The chuck of claim 1, wherein the elongated stem portion includes a broadband actuator assembly.
3. The chuck of claim 2, wherein the broadband actuator assembly comprises:  
a longitudinal bore formed into an interior portion of the stem portion, the longitudinal bore having a terminating end;  
a piston assembly slidably positioned in the longitudinal bore; and  
at least one fluid inlet in communication with the longitudinal bore, the at least one fluid inlet being configured to impart longitudinal motion to the piston assembly through introduction of fluid pressure to the longitudinal bore.
4. The chuck of claim 1, wherein the annular substrate receiving member comprises a disk shaped member having an upper substrate receiving surface and an underside, the substrate receiving surface having a plurality of vacuum channels formed therein.
5. The chuck of claim 4, wherein the plurality of vacuum channels are in fluid communication with a vacuum cavity formed by the hemispherical reinforcement member via a selectively actuated valve.

6. The chuck of claim 4, wherein the underside includes a plurality of reinforcement ribs configured to prevent deflection of the upper substrate receiving surface.

7. The chuck of claim 1, further comprising an air knife assembly mounted proximate the perimeter of the annular substrate receiving member, the air knife assembly being configured to generate a laminar flow of gas across the substrate surface.

8. The chuck of claim 1, wherein the hemispherical reinforcement member comprises a hemispherically shaped member having a first open end having a first radius and a second substantially closed end having a second radius, the second radius being smaller than the first radius.

9. The chuck of claim 8, wherein the first end is attached to an underside of the annular substrate receiving member and the second end is attached to a distal end of the elongated stem member.

10. The chuck of claim 9, wherein the attachment of the first end to the underside forms a vacuum cavity, the vacuum cavity being selectively in communication with a vacuum source and a plurality of vacuum channels formed into the upper substrate receiving surface.

11. A substrate support member for a particle cleaning chamber, comprising:  
a substrate receiving member;  
a reinforcement member attached to an underside of the substrate receiving member;  
an elongated stem member attached to the reinforcement member; and  
an actuator device in communication with the elongated stem member.

12. The substrate support member of claim 11, wherein the substrate receiving member comprises a disk shaped member having an upper substrate receiving

surface and an underside, the upper substrate receiving surface having a plurality of vacuum channels formed therein.

13. The substrate support member of claim 12, wherein the underside further comprises a plurality of reinforcement ribs formed therein, the plurality of reinforcement ribs being configured to prevent deflection of the upper substrate receiving surface.

14. The substrate support member of claim 11, wherein the reinforcement member comprises a hemispherically shaped member attached at a first end to an underside of the substrate receiving member and at a second end to the elongated stem member, the first end having a larger radius than the second end.

15. The substrate support member of claim 11, wherein the reinforcement member comprises a conic-shaped member attached at a first end to the elongated shaft and at a second end to an underside of the substrate receiving member, the first end having a smaller radius than the second end.

16. The substrate support member of claim 11, wherein the actuator device comprises a selectively actuated piston assembly.

17. The substrate support member of claim 11, wherein the actuator device comprises:

- a piston bore formed into the elongated stem assembly, the piston bore being formed parallel to a longitudinal axis of the elongated stem assembly and having an upper terminating end;

- a piston assembly slidably positioned in the piston bore; and

- a propulsion source in communication with the piston bore, the propulsion source being configured to slidably urge the piston assembly toward the upper terminating end of the piston bore.

18. The substrate support member of claim 11, wherein the actuator device is a broadband actuator device.

19. The substrate support member of claim 11, further comprising an air knife assembly positioned proximate a perimeter of the substrate receiving member, the air knife assembly being configured to generate a laminar flow of air across a substrate receiving surface of the substrate receiving member.